UPPER ATMOSPHERE RESEARCH
SATELLITE JITTER STUDY

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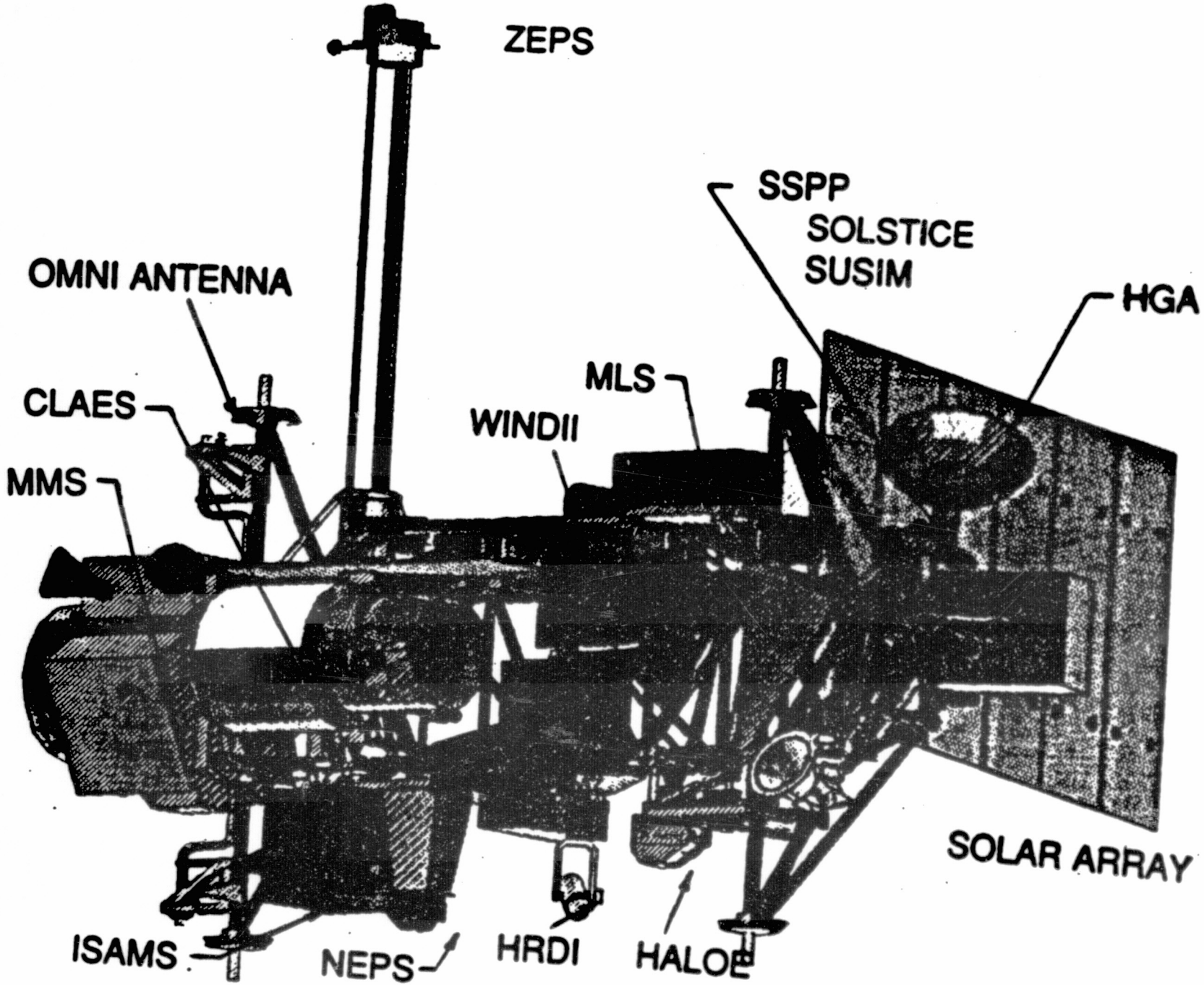
UARS
A Global Probe
of Earth's Upper
Atmosphere

UARS JITTER STUDY OBJECTIVES

- ANALYSIS OF IN-FLIGHT JITTER
- EVALUATE DIFFERENT MODELS OF UARS
- DETERMINE JITTER PREDICTION ACCURACY SUCH THAT ADEQUATE (BUT NOT EXCESSIVE) DESIGN MARGINS WILL ASSUME FUTURE MISSION SUCCESS


ZEPS
SSPP
SOLSTICE
SUSIM
OMNI ANTENNA
HGA
MLS
CLAES
WINDII
MMS
SOLAR ARRAY
ISAMS
NEPS
HRDI
HALOE

UARS CHRONOLOGY

SEPT. 12, 1991	LAUNCH
MAY 1, 1992	DISTURBANCE EXPERIMENT
JUNE 1, 1992	SOLAR ARRAY DRIVE ANOMALY
JUNE 3, 1992	SOLAR ARRAY PARKED
JULY 13, 1992	SOLAR ARRAY NORMAL OPS

DATA CASES :

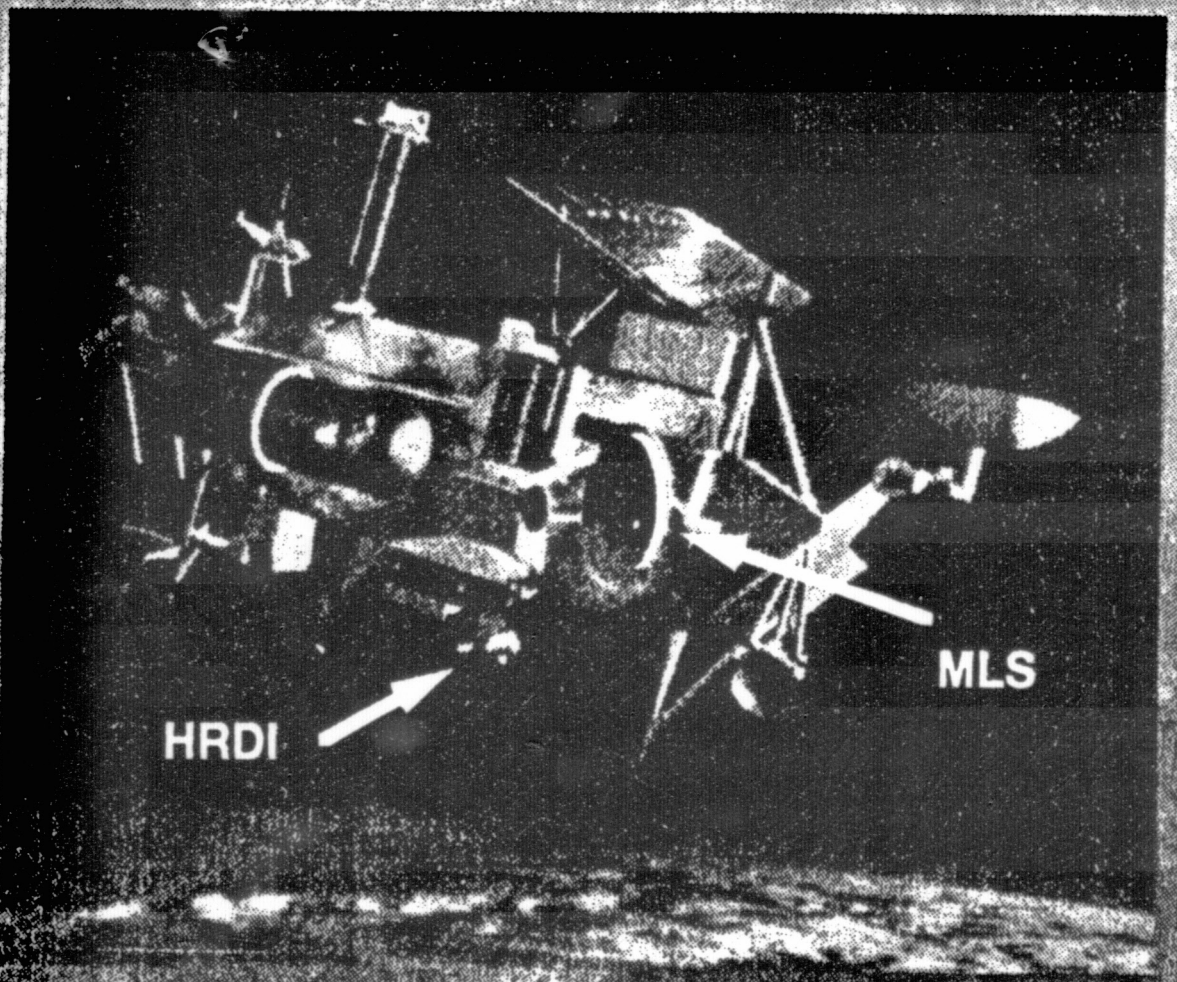
- DISTURBANCE EXPERIMENT
- YAW MANEUVER, ORBIT ADJUST
- SOLAR ARRAY ANOMALY
- HALOE SUN SENSOR
- THERMAL SNAP
- NO INSTRUMENT DISTURBANCES
- NUMEROUS ORBITS OF NORMAL OPERATIONS
- SKEW REACTION POWERED DOWN
- MLS, SSPP, HGA, REACTION WHEELS

UARS DISTURBANCE EXPERIMENT OBJECTIVES

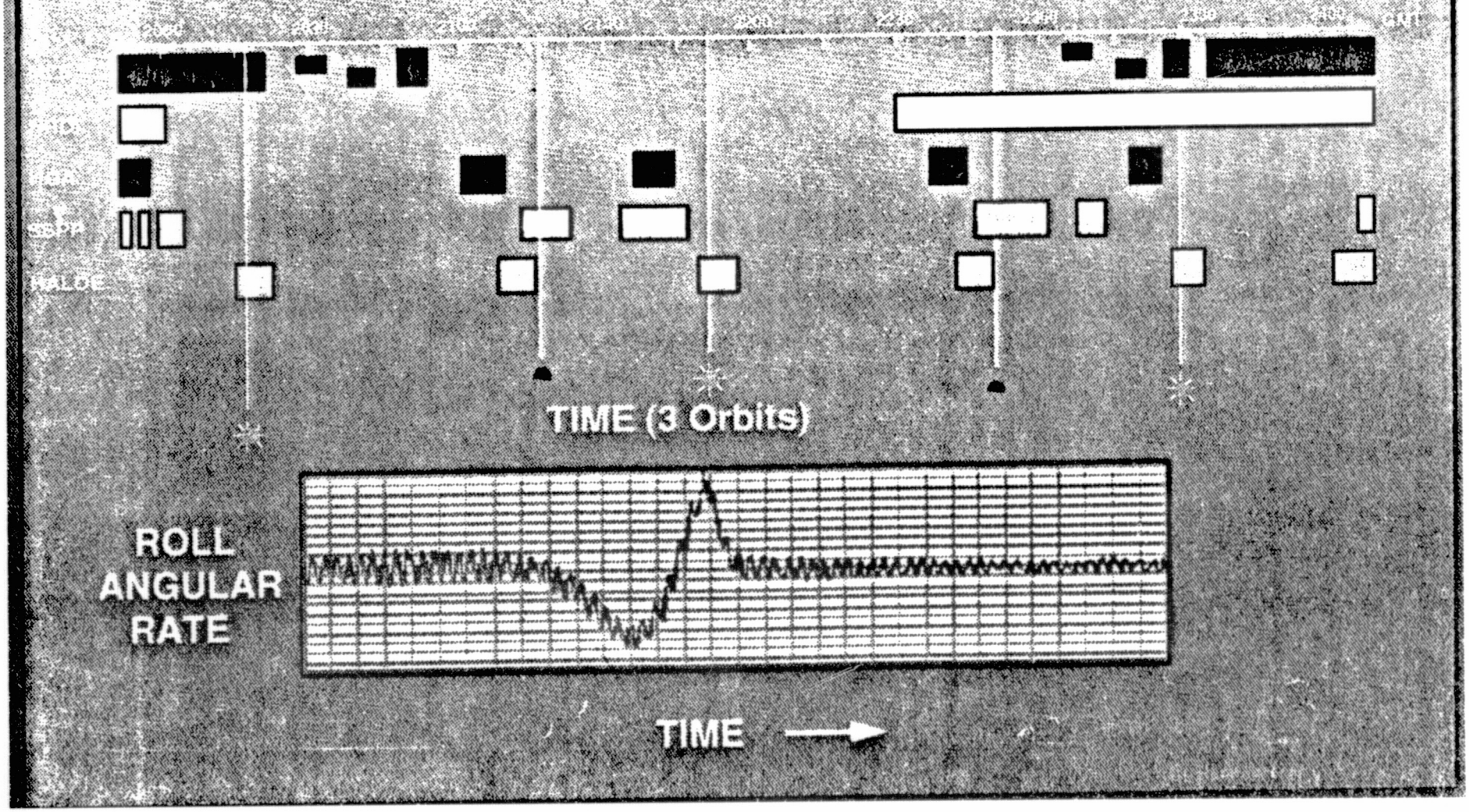
UARS Disturbance Experiment on May 1, 1992

- Pointing jitter due to each individual instrument
- Pointing jitter due to concurrent disturbances
- "No disturbance case"
- System I. D. responses
- Participants : LaRC, GSFC, General Electric
  JPL Microwave Limb Sounder Team
  University of Michigan - High Resolution Doppler Imager

UARS DISTURBANCE EXPERIMENT



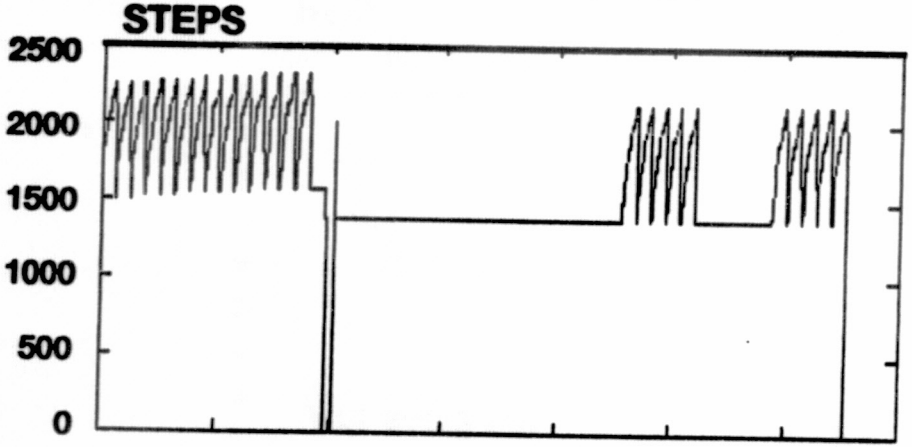
UARS DISTURBANCE EXPERIMENT

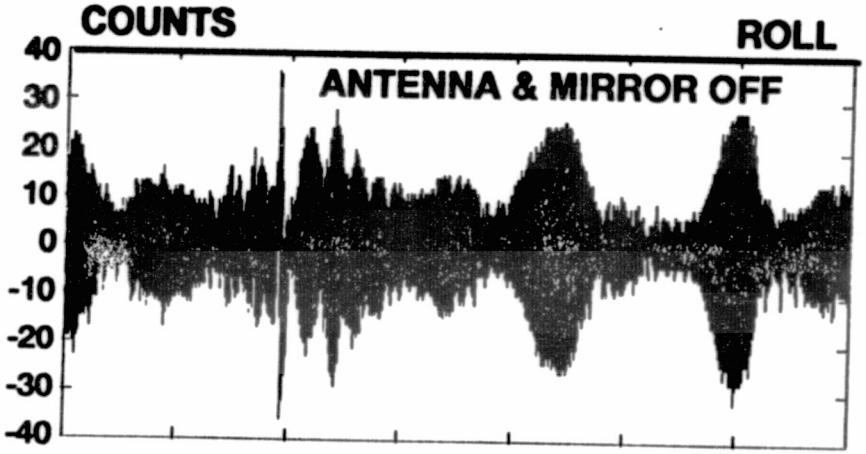


MICROWAVE LIMB SOUNDER

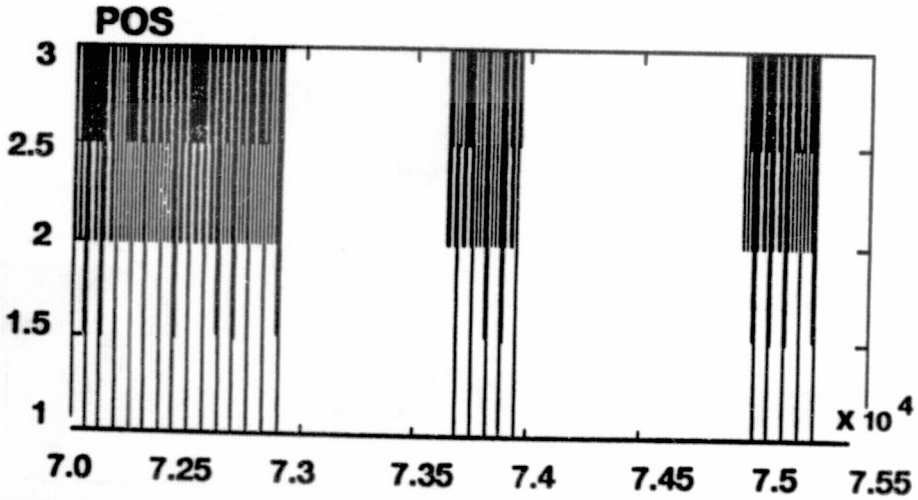
ANTENNA & MIRROR TIME PROFILES

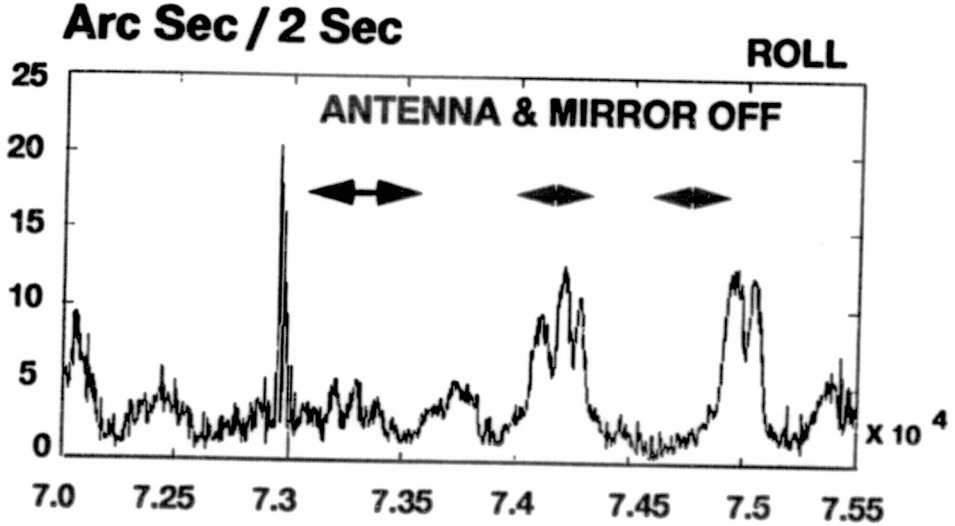
MLS ANTENNA



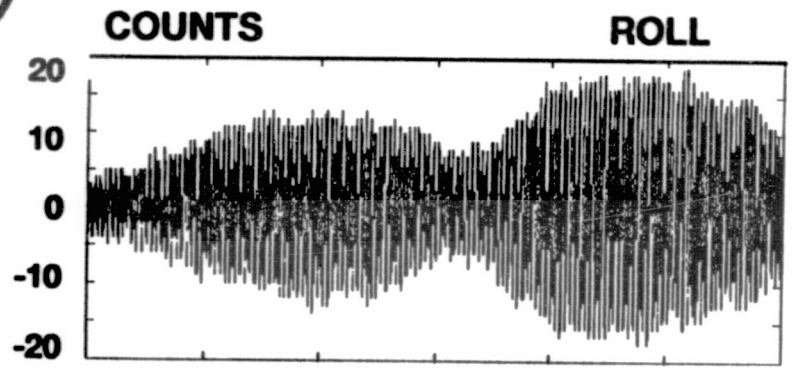


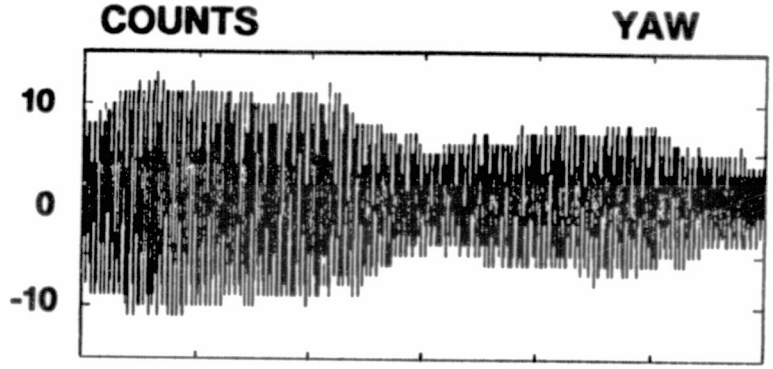
MLS SCANNING MIRROR

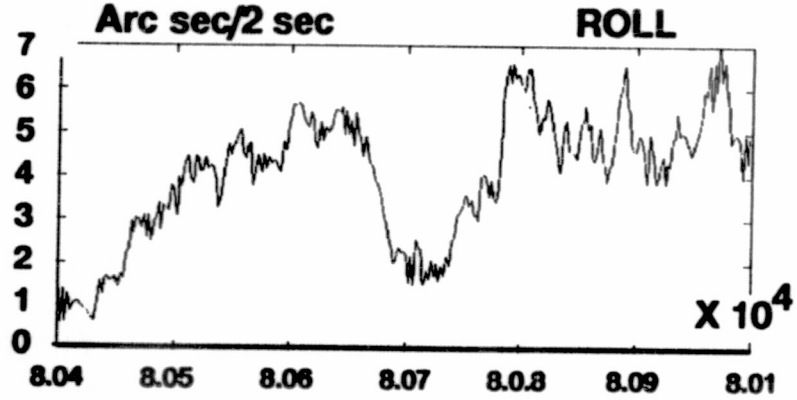


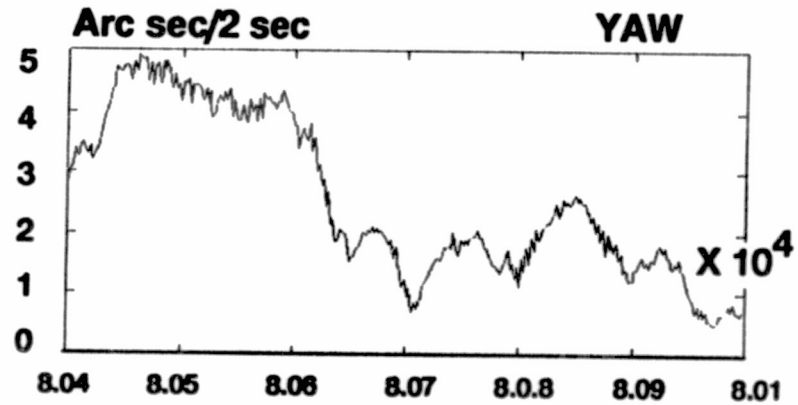


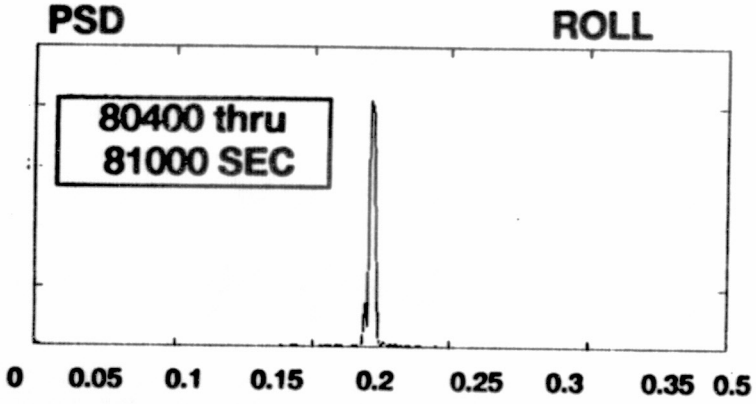
SOLAR ARRAY DRIVE DISTURBANCE

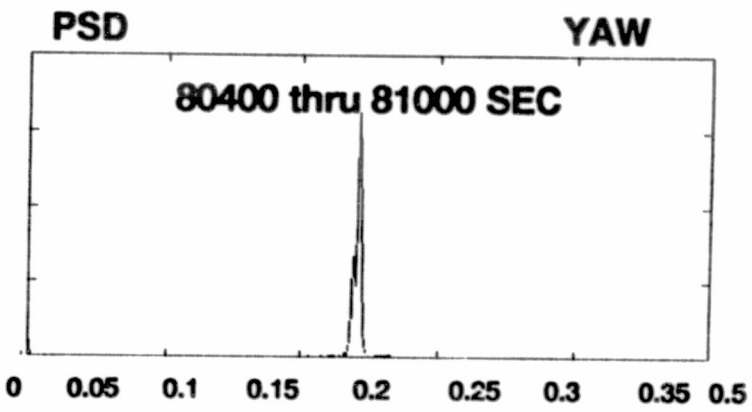




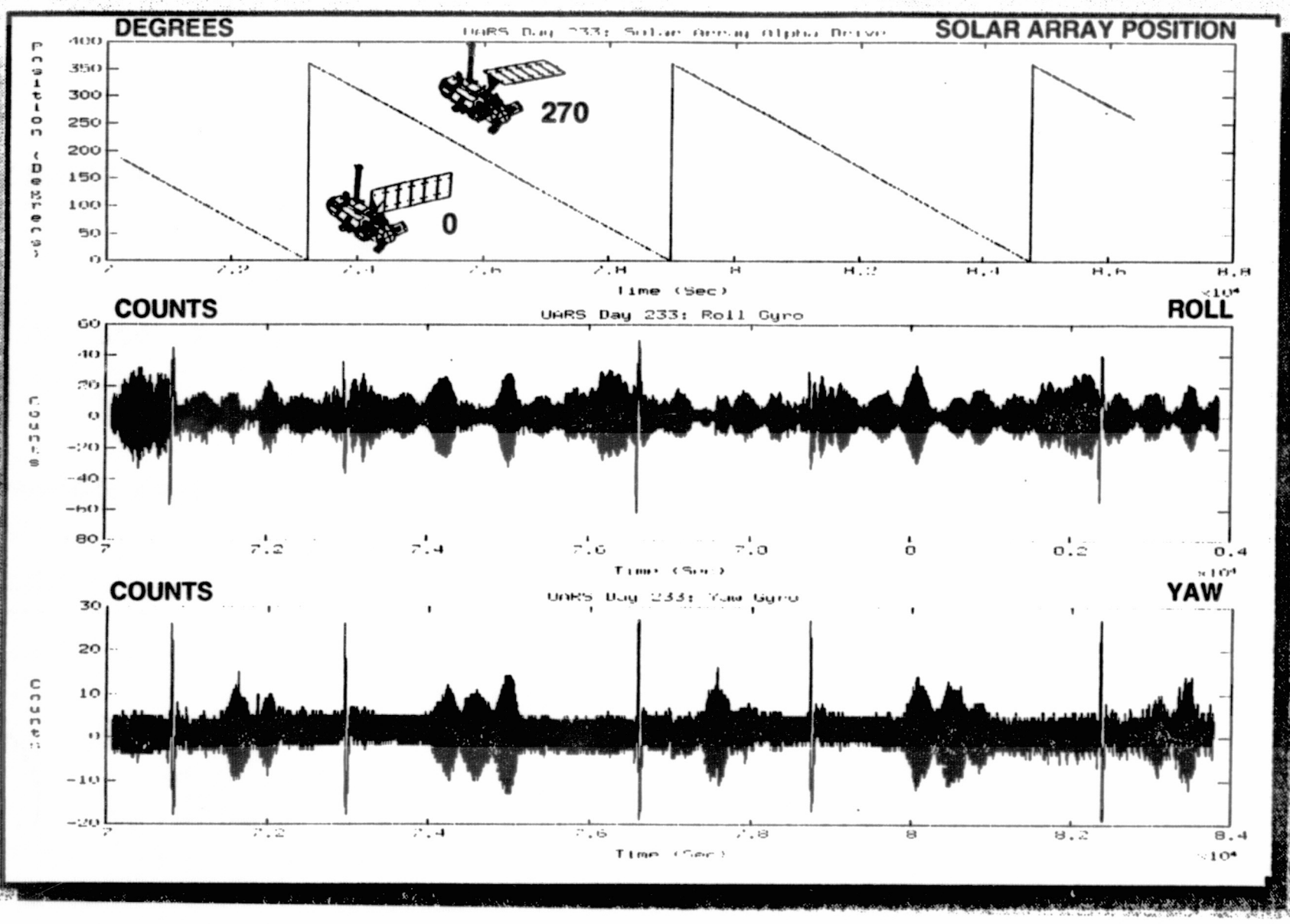






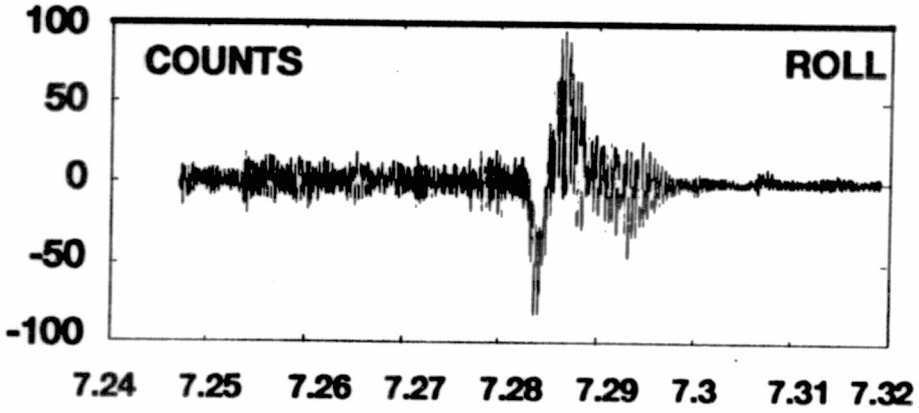


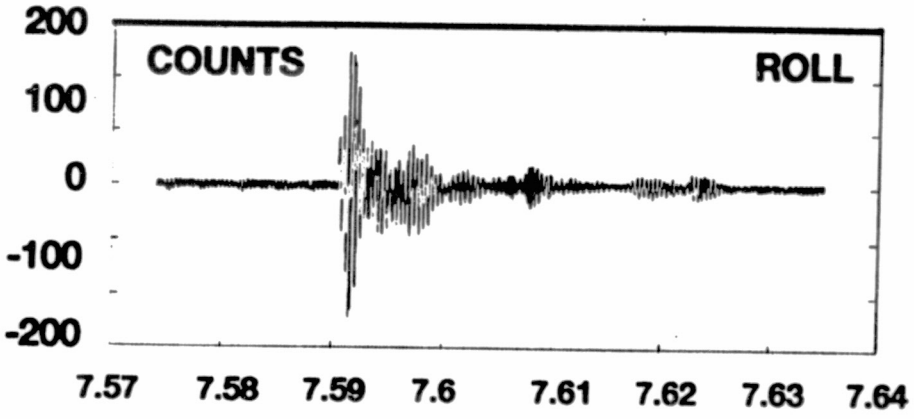
ROLL & YAW JITTER CORRELATION WITH SOLAR ARRAY POSITION



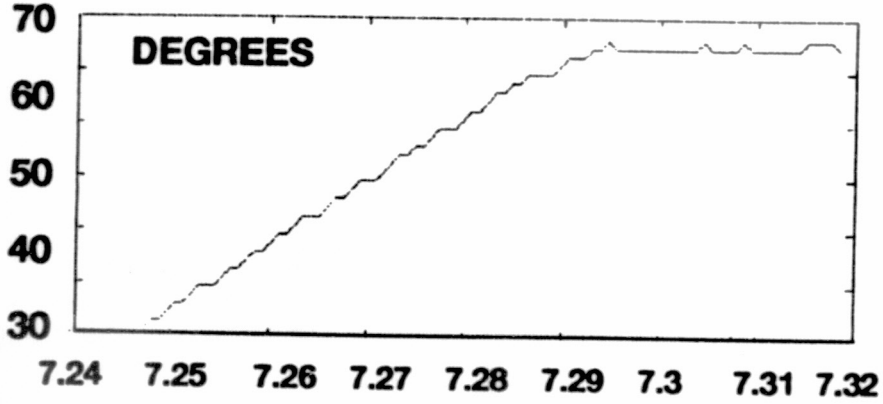
SOLAR ARRAY ROTATION

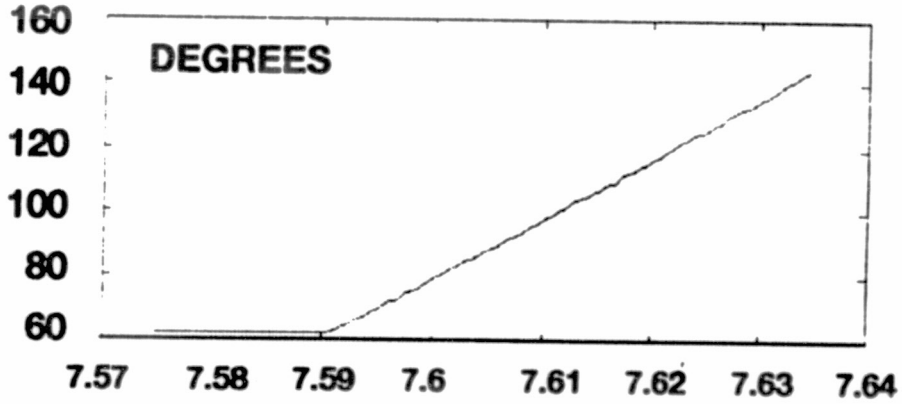
JUNE 2, 1992





SOLAR ARRAY POSITION





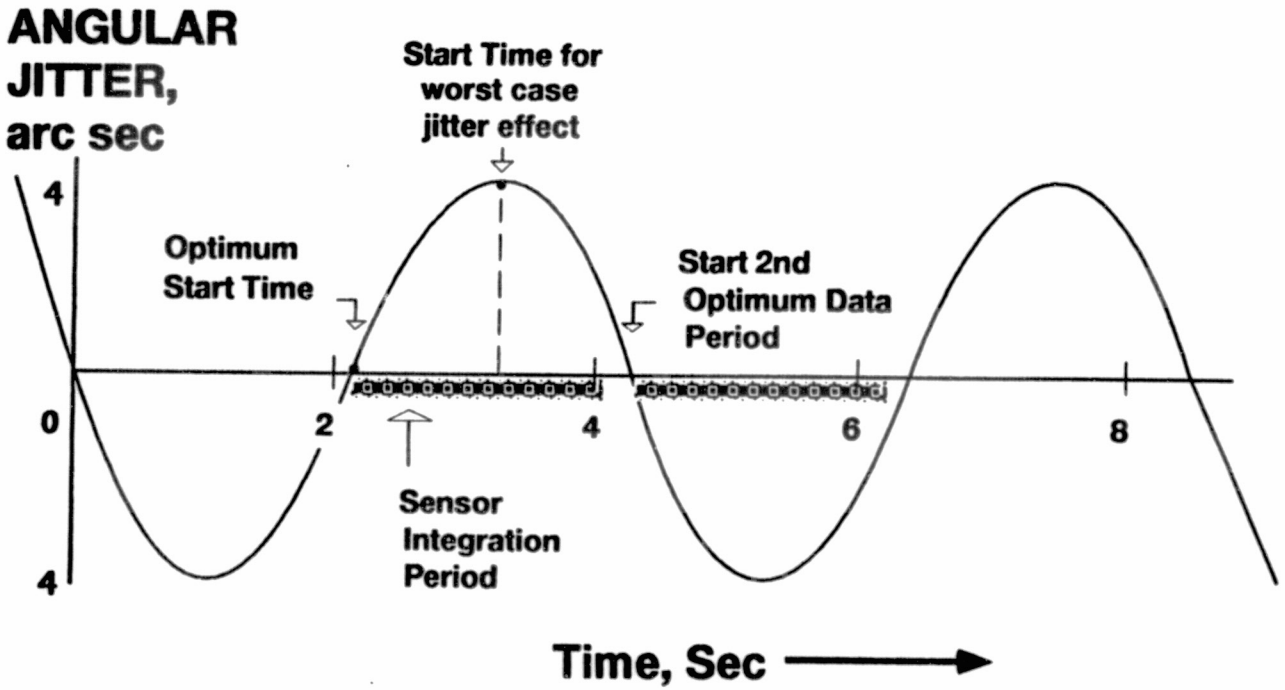
Solar Array is Dominant Disturbance Source

Damping 2.8%

UARS DISTURBANCE SUMMARY

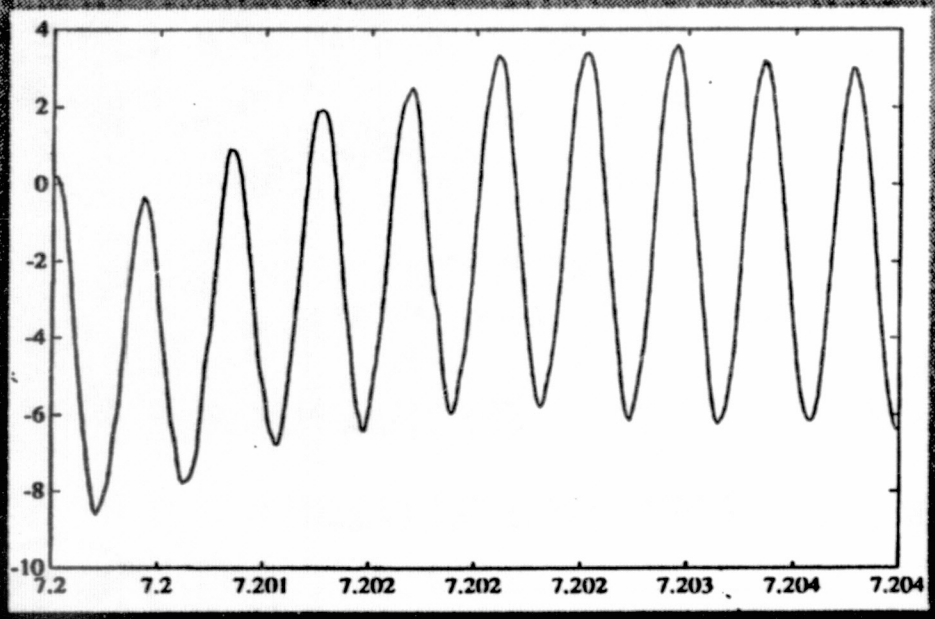
SOURCE	RIGID-BODY PLATFORM MOTION			JITTER (ARC SEC/2 SEC)			FLEXIBLE MODES EXCITED (HZ)		
	ROLL	PITCH	YAW	ROLL	PITCH	YAW	ROLL	PITCH	YAW
MLS	YES	NO	NO	2.25	0.50	0.50 0.10	0.256 0.988 1.005	0.2622 0.2837 2.2110	2.9329 0.2407
HALOE **	YES	YES	YES	2.50	1.80	1.40	0.951	0.8070	0.9510
HRDI DAY ** SCAN	YES	YES	YES			1.60	0.2478 0.2404	0.2709	2.9330 0.2365
HRDI NIGHT ** SCAN	YES	YES	YES			1.90	0.945 0.2365	0.9664 0.2450	0.9492 2.9286
SOLAR ARRAY	NO	NO	NO	17.0, VARIES WITH POSITION/DIRECTION			0.240	0.2686	0.2422
WHEELS WITH CONSTANT RPM	NO	NO	NO	0.50	0.50	0.50	2.942 0.245	0.2454 1.9627	2.9420 0.2454

CONCEPT for REDUCTION of JITTER EFFECT

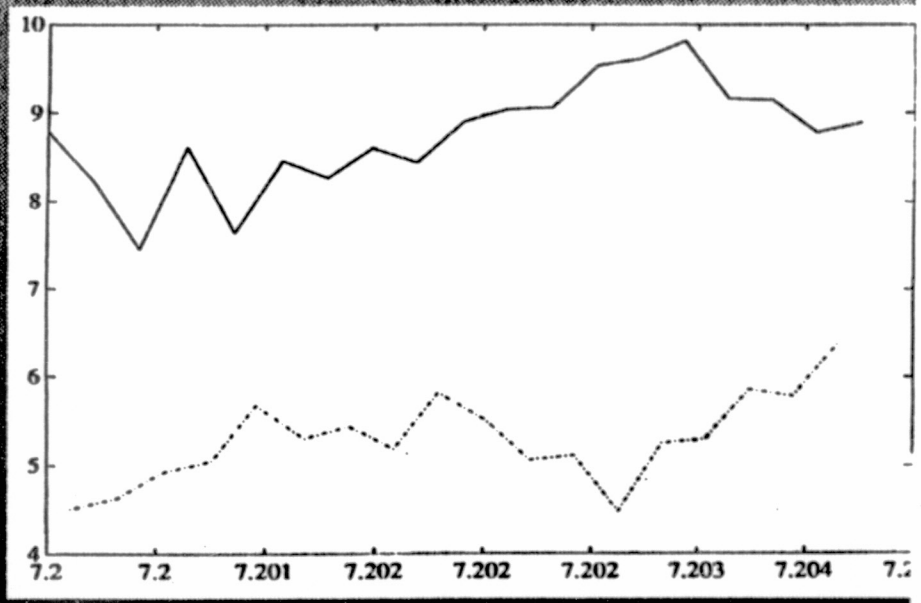


JITTER REDUCTION USING WINDOW SCHEDULING

ROLL DISPLACEMENT



ROLL JITTER



MAY 1, 1992 - UARS DAY 0233

HIGHLIGHTS / LESSONS LEARNED

- NEED FOR JITTER STUDY AND ACCELEROMETER
- INSTRUMENT / SUBSYSTEM DISTURBANCE ANALYSIS
- SOLAR ARRAY DRIVE
  - Major jitter source correlated with ground track
- UARS DISTURBANCE EXPERIMENT
  - May 1 experiment data used solar anomaly analysis

JITTER REDUCTION METHOD FOR WIND II

DAMPING

RESULTS APPLIED TO EOS :
- SOLAR DRIVE DYNAMICS
- REACTION WHEEL DYNAMICS